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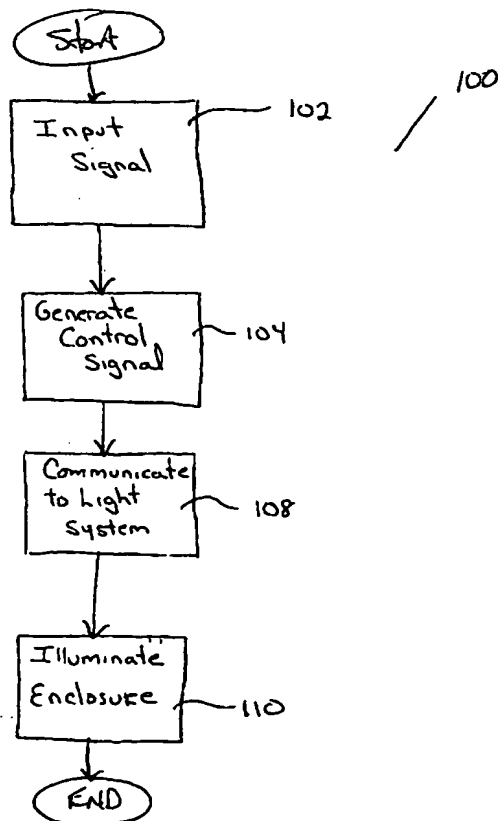
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[Continued on next page]

(54) Title: SYSTEMS AND METHODS FOR COLOR CHANGING DEVICE AND ENCLOSURE



(57) Abstract: A color-changing device which includes an enclosure at least a portion of which is material which is desired to change color. There is also included an illumination device, such as an LED or collection of LEDs which can illuminate the material. There can also be included a controller which can take some form of input, such as from a network, or a sensor, and can convert that input into a signal to control the illumination. There is also included a method for performing such color change.

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Systems and Methods for Color Changing Device and Enclosure

Related Applications

This Patent Application claims the benefit of priority to U.S. Provisional Application Serial Number 60/221,579 filed July 28, 2000, entitled "Color Changing
5 Device and Enclosure."

Background of The Invention

1. Field of the Invention

The invention relates to systems and methods for the design of devices and
10 enclosures, in particular for the design of enclosures that can change color.

2. Description of Related Art

Computers have recently been introduced where the computer enclosure is a color other than the conventional beige. These computers are offered in a variety of colors.
15 The enclosures are formed of a semi-transparent plastic of a particular color, such as blue, red or green. The enclosures are slightly translucent to allow the user to see the internal components of the computer. The use of brightly and interestingly colored enclosures for various different types of devices is becoming more and more popular. Cellular phones can now have covers or button sets produced in a variety of different
20 colors that can be transparent or semi-transparent or can be decorated with figures or symbols. Personal Digital Assistants (PDAs) have also recently been introduced that have a transparent or semi-transparent enclosure in a variety of colors.

A problem with these enclosures is that they only come in a static color. Once you have bought a blue computer you keep a blue computer unless you want to purchase
25 a new enclosure in a different static color. This is an upgrade that can be expensive and require significant time to install. In addition, the color cannot easily change in response to computer states or digital information. A single enclosure capable of color changing would be desirable to eliminate the static color requirements of the present enclosure.

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Summary of the Invention

One embodiment of the present invention is a color-changing device. The color changing device may include an enclosure; a piece of material which is to be illuminated which makes up at least a portion of said enclosure; and an illumination device for

5 illuminating said material.

Another embodiment of the present invention is directed to a method for changing the color of a device. The method involves the acts of providing a device; illuminating at least a portion of said device; and changing the color of said illumination.

A further embodiment of the present invention is directed to a method for
10 changing the color of a device. The method involves the acts of generating an input signal; generating a control signal in response to the input signal; communicating the control signal to a lighting system; and arranging the lighting system to illuminate at least a portion of the device enclosure.

Brief Description of the Drawings

15 Figure 1 is a flow diagram of a process according to one embodiment of the present invention.

Figure 2 illustrates a device with a lighted enclosure according to one embodiment of the present invention.

Detailed Description

20 In one embodiment of the invention an illumination system such as an LED system of one or more LEDs is arranged to edge light or backlight an enclosure to provide a colored enclosure or a color changing enclosure. One possible technology for
25 implementing color changing illumination systems is described in United States Patent No. 6,016,038, the disclosure of which is herein incorporated by reference. In addition, color changing illumination systems need not be LED based and in other embodiments of the invention the color changing illumination devices could comprise, but are not limited to, fiber optic strands, incandescent lighting, fluorescent lighting, or other solid-state
30 technology such as Electro-luminescent (EL) or organic LED-based devices (OLED).

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The enclosure could be an enclosure for any type of device such as, but not limited to; a desktop, laptop, server, hand-held, web-access, or any other type of computer, computer peripherals or accessories (such as, but not limited to, disk drive, mouse or other pointing device, printer, scanner, keyboard, cables, or modem) media
5 players; DVD players and recorders; CD players and recorders; tape players and recorders; stereo receivers; self contained stereo systems; televisions; television remote controls or other peripherals; cable TV decoder boxes; projection systems; speakers and speaker systems; landline or wireless telephones; radio frequency (RF) transmission or communication devices; personal digital assistants (PDAs); toys; watches; appliances;
10 refrigerators; stoves; ovens; dishwashers; trash compactors; hand held devices; or any other device or article with an enclosure.

The enclosure can be made of any transparent, semi-transparent, translucent or semi-translucent material, however, for ease of discussion, the material will be referred to as translucent to mean any of the above properties. The material can be entirely
15 translucent or a portion of the material can be translucent. The LEDs can be arranged to edge light the enclosure such that a portion of the light couples to the enclosure edge and is transmitted through the material and/or a portion of the light is transmitted across the surface of the enclosure. Light traveling along the surface or through the material will be reflected off of or out of the material by imperfections in the material. These
20 imperfections can be introduced deliberately or through inherent properties of the material. Making patterns of imperfections on or in the material can create surface lighting effects. The imperfections can also be applied to the entire surface to provide a glowing surface.

The LEDs can also be arranged to back light the enclosure or a surface behind the
25 enclosure. Back lighting can achieve the same effects as edge lighting, or different effects could be achieved if a panel within the enclosure was backlit. The LEDs could be arranged to direct the emitted light at any direction at or near the enclosure to provide illumination of the enclosure. They could also be arranged to project patterns or symbols onto the enclosure. In one embodiment, the LEDs (or other lighting system) are disposed
30 within the enclosure.

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Figure 2 illustrates a system according to the principles of the present invention. In this embodiment, the device 200 is a computer monitor with an enclosure 202. The system includes an illumination device 204 that is arranged to illuminate the enclosure or some portion thereof.

5 The illumination system can be controlled with a microprocessor or with passive circuitry. In an embodiment, the circuitry or microprocessor can provide a pulse width modulated signal or other control signals to drive the illumination system. Previously referenced Unites States Patent No. 6,016,038 provides one possible method for doing this. The circuitry or microprocessor can also include a controller to provide an input
10 signal from the enclosed device or another device. The controller could be any type of software process, hardware, or separate device that can receive input signals from a switch, transducer, processor, sensor, or receiver either directly as a digital signal or an analog signal through an Analog/Digital converter. If at least two different colored illumination devices are used in the illumination system, they can be controlled through
15 separate control signals, separate sensors, or separate controllers to provide a variety of colors to the enclosure.

One embodiment of the invention would be to use the color changing or lighted enclosure as a computer enclosure or a portion of the computer enclosure. The color changing effects could be controlled through the controller to correlate or respond to
20 signals generated within the enclosed computer, from a computer network, or from another device. The enclosure may also change color on demand through external switching or transducers or could be controlled internal to the computer by user controlled software or hardware. With the former arrangement, the computer could change colors as the result of the computer receiving email or other information, or could
25 change colors with regard to system activity, for instance a busy computer could be red while a ready computer was green. The enclosure could also change colors as a result of changing variables from a network. In one embodiment, it could change colors based on information received from the World Wide Web. For example, if stock prices fall according to a particular website or websites, the enclosure could turn red and if they go
30 up the enclosure could change to blue. The system could also be used in conjunction with e-business or Internet advertising allowing an individual having a site or

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advertisement on the Internet to transmit colors they desired the enclosure to be. For example, Coca-Cola could turn a user's enclosure red (or even Coca Cola's specific shade of red) when the user views pages posted by Coca-Cola or when ads for Coca-Cola are presented to the user. Alternatively, the colors chosen could simply be determined to encourage the users purchase of certain types of products. For instance, red and yellow could be presented with food ads or pages as these colors are believed to promote purchases of food items.

In a still further embodiment, the system could be linked with an external sensing device to determine color. For instance, the device could be linked to a color sensor designed to detect the color of the device's surroundings and match, contrast, or otherwise select a color for the enclosure based on the surroundings. Alternatively, the device could be linked to a temperature, pressure, motion or other variable detection device so the device could function as an indicator of this variables current value.

Another embodiment of the invention would be a refrigerator where the front panel or a potion of the front panel was lit and changed colors with response to the temperature inside the unit. The refrigerator panel could also be receiving external signals of outside temperature or stock prices as in the computer example, or provide colors to a dieter to either encourage or discourage eating at a particular time.

Another embodiment would be the entire enclosure or a portion of an enclosure of an audio speaker or television where the color changing is linked to the audio or video signal where the signal may be preconditioned to provide certain lighting effects associated with the signal.

Although the changing of color has been described here, it is also included within the scope of this disclosure that in one embodiment the system could vary color on a specific scale (as opposed to generic red or green, a specific shade of red could be produced) or any other characteristics of the light could be altered such as, but not limited to, intensity, saturation, hue. The system could also be programmed with patterns or schemes for regularly changing colors and any of the characteristics of those patterns such as, but not limited to, speed or repetition could also be controlled. In another embodiment multiple pieces of information could also be provided on different portions of the enclosure as different colors so, for example a computer enclosure could indicate

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that the stock market is falling, and your broker has sent you e-mail. In still another embodiment, the illumination of the device could be sufficient to actually provide a light source for a room or other area.

In another embodiment the illumination device could provide a constant color not
5 designed to be changed.

Figure 1 illustrates a process according to one embodiment of the present invention. In this embodiment, an input signal may be generated at act 102. A control signal may be generated at act 104 in response to the input signal. The control signal 104 may then be communicated (in act 108) to a lighting system which then illuminates an
10 enclosure (act 10).

The input signal 102 may be generated by any number of sources. For example, the input signal 102 may be generated by a user interface such as a button, switch, keyboard, mouse, software interface, graphical user interface, or other user interface, a sensor or transducer, or another source such as a database, network, World Wide Web, or
15 other signal generator (e.g. email alert signal, financial data from the web). The input signal 102 may comprise a combination of signal generators. For example, the lighting system may be responding to financial data and a user interface may be used to adjust the settings of the illumination.

In one embodiment, the input signal 102 may be converted into a lighting control
20 signal. For example, the input signal 102 may be generated and or encoded with information corresponding to its source. Upon receipt of such a signal, a system according to one embodiment of the invention may generate corresponding lighting control signals. The generator may analyze the input signal and find that it originated from a financial database, for example. The generator may then select or generate
25 control signals based on this information. The generator may be a processor that selects lighting control signals from an associated memory, generates a control signal based on an algorithm, modifies a control signal or program, selects a table or generates control signals through other methods. It should be appreciated that there are a number of ways to generate lighting control signals and the present invention should not be limited to any
30 particular method.

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In one embodiment, the control signals 104 may be communicated to a light system 108 arranged to illuminate an enclosure or portion thereof. In one embodiment, the light system may include at least one LED. In another embodiment, the light system may include two or more LEDs of different colors, wherein at least one of the LEDs is controlled through the control signal in such a way as to change the color of the emitted light from the light system. The light system may include three different colored LEDs (e.g. red, green, and blue) wherein the three colors are independently controlled through the control signals such that the emitting light from the light system can be changed.

As used herein, the term "LED" should be understood to include light emitting diodes of all types, light emitting polymers, semiconductor dies that produce light in response to current, organic LEDs, electro-luminescent strips, and other such systems. "LED" may refer to a single light emitting diode having multiple semiconductor dies that are individually controlled. It should also be understood that the term "LED" does not restrict the package type of the LED. The term "LED" includes packaged LEDs, non-packaged LEDs, surface mount LEDs, chip on board LEDs and LEDs of all other configurations. The term "LED" also includes LEDs packaged or associated with material (e.g. a phosphor) wherein the material may convert energy from the LED to a different wavelength.

While the invention has been disclosed in connection with the preferred embodiments shown and described in detail, various modifications and improvements thereon will become readily apparent to those skilled in the art. Accordingly, the spirit and scope of the present invention falls within the scope of the following claims and their equivalents.

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Claim(s)

1. A color-changing device, comprising:
an enclosure including at least a piece of material which is to be illuminated; and
an illumination device, disposed within the enclosure, to illuminate said material,
5 the illumination device capable of generating at least two colors.
2. The color-changing device of claim 1, wherein said device is a computer.
3. The color-changing device of claim 1, wherein said device includes one or more
10 of the following: a disk drive, a mouse, a pointing device, a printer, a scanner, a
keyboard, a cable, a modem, a media player, a DVD player, a DVD recorder, a CD
player, a CD recorder, a tape player, a tape recorder, a stereo receiver, a self contained
stereo system, a television, a television remote control, a television peripheral, a cable
TV decoder box, a projection system, a speaker, a landline telephone, a wireless
15 telephone, a radio frequency (RF) transmission device, an RF communication device, a
personal digital assistants (PDA), a toy, a watch, an appliance, a refrigerator, a stove, an
oven, a dishwasher, a trash compactor, and a hand-held device.
4. The color-changing device of claim 1, wherein said piece of material is at least
20 one of transparent, semi-transparent, translucent, and semi-translucent.
5. The color-changing device of claim 1, wherein said piece of material contains
imperfections.
- 25 6. The color-changing device of claim 1, wherein said illumination device includes
an LED.
7. The color-changing device of claim 1, further comprising a controller for
controlling the lighting device.

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8. The color-changing device of claim 7, wherein said controller receives input from a network.

9. The color-changing device of claim 7, wherein said controller receives input from
5 a user of the color-changing-device.

10. A method for changing the color of a device, the method comprising acts of:
providing a device having an illumination device disposed therein, the
illumination device capable of generating at least two colors;
10 illuminating at least a portion of said device, via the illumination device; and
changing the color of said illumination.

11. The method of claim 10, wherein, said act of illuminating is performed by at least
one LED.

12. The method of claim 10, wherein said act of illuminating the portion of said
device includes illuminating an enclosure of the device.

13. The method of claim 10, wherein the act of illuminating is performed by at least
20 two LEDs; and the act of changing the color of the illumination is accomplished by
controlling at least one of the at least two LEDs.

14. A method for changing the color of a device, the device having an enclosure, the
method comprising acts of:
25 generating an input signal;
generating a control signal in response to the input signal;
communicating the control signal to a lighting system; and
arranging the lighting system to illuminate at least a portion of the device
enclosure.

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15. The method of claim 14, wherein the act of generating the input signal is accomplished through a user interface.

16. The method of claim 15, wherein the user interface is at least one of a switch,
5 dial, button, key, and key board.

17. The method of claim 15, wherein the user interface is a graphical user interface.

18. The method of claim 14, wherein the act of generating the input signal is
10 accomplished through at least one of a sensor and transducer.

19. The method of claim 14, wherein the act of generating the input signal is accomplished by receiving a signal.

15 20. The method of claim 19, wherein the signal is at least one of a network signal, database signal, and information signal.

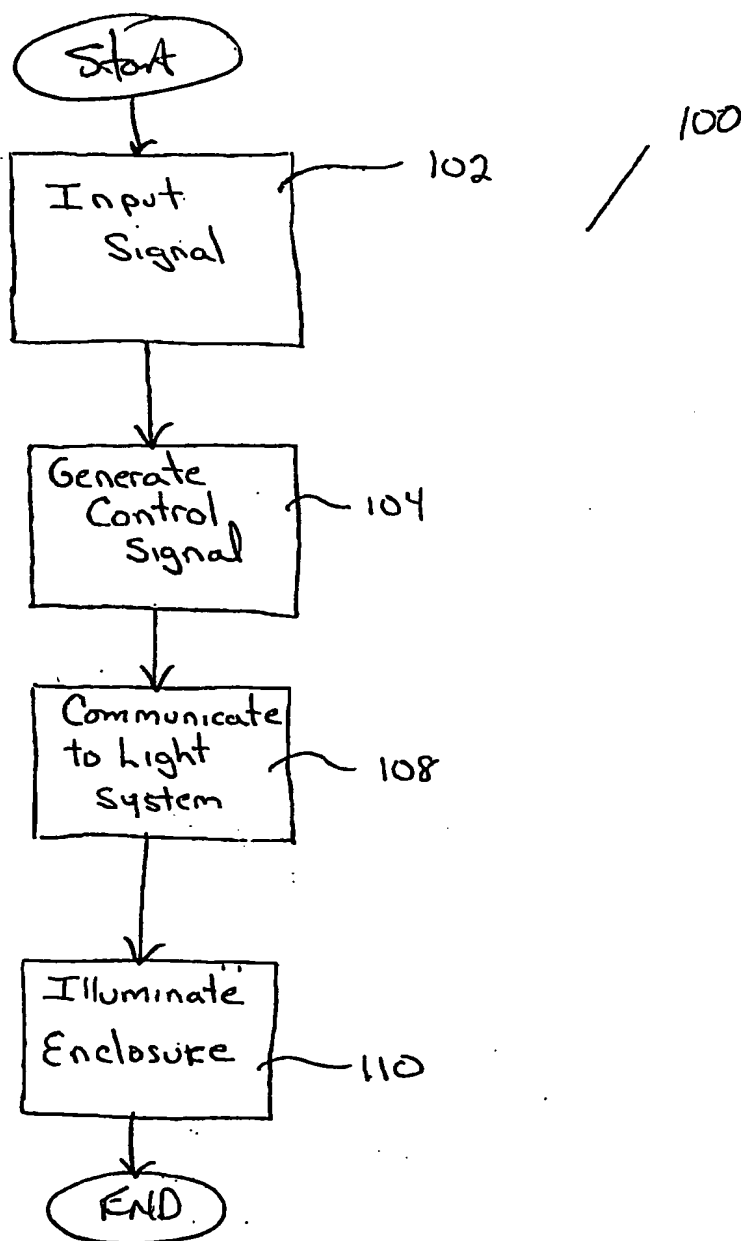


Fig 1

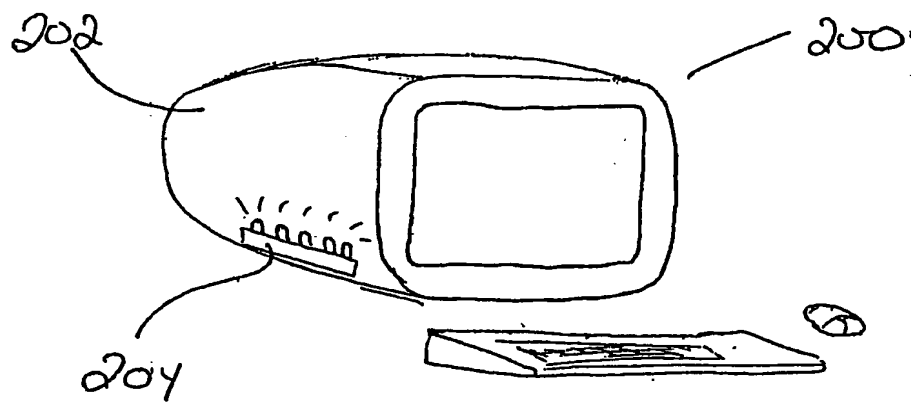


Fig 2

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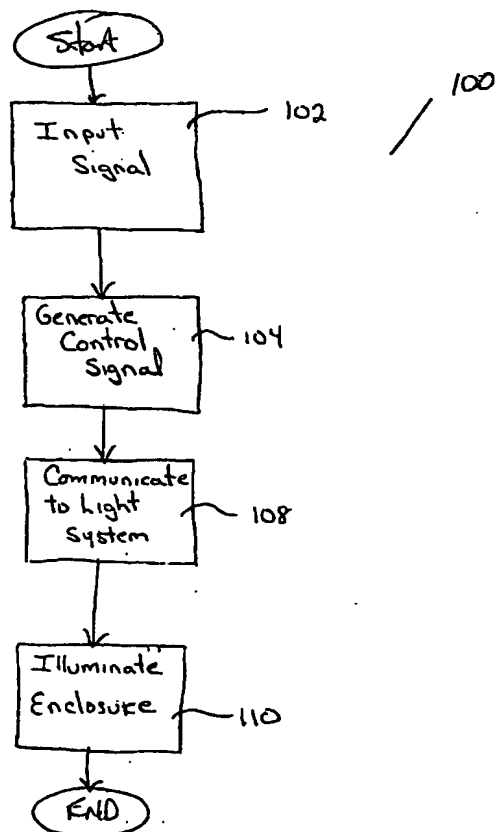
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[US/US]; Suite 1100, 10 Milk Street, Boston, MA 02108 (US).
- (72) Inventor: **DOWLING, Kevin, J.**; 23 Village View Road, Westford, MA 01886 (US).
- (74) Agent: **GIUNTA, Richard, F.**; Wolf, Greenfield & Sacks, P.C., 600 Atlantic Avenue, Boston, MA 02210 (US).
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[Continued on next page]

(54) Title: **METHOD FOR CHANGING COLOR**



(57) Abstract: A color-changing device which includes an enclosure at least a portion of which is material which is desired to change color. There is also included an illumination device, such as an LED or collection of LEDs which can illuminate the material. There can also be included a controller which can take some form of input, such as from a network, or a sensor, and can convert that input into a signal to control the illumination. There is also included a method for performing such color change.

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A. CLASSIFICATION OF SUBJECT MATTER IPC 7 G06F1/18		
According to International Patent Classification (IPC) or to both national classification and IPC		
B. FIELDS SEARCHED Minimum documentation searched (classification system followed by classification symbols) IPC 7 G06F		
Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched		
Electronic data base consulted during the international search (name of data base and, where practical, search terms used) EPO-Internal, PAJ, WPI Data		
C. DOCUMENTS CONSIDERED TO BE RELEVANT		
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* Special categories of cited documents :		
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Date of the actual completion of the international search <div style="text-align: center; font-weight: bold;">2 April 2003</div>		Date of mailing of the international search report <div style="text-align: center; font-weight: bold;">10/04/2003</div>
Name and mailing address of the ISA European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl, Fax: (+31-70) 340-3016		Authorized officer <div style="text-align: center; font-weight: bold;">Rydman, J</div>

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